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DOI:

[10.1016/j.schres.2015.08.029](https://doi.org/10.1016/j.schres.2015.08.029)

Document Version

Early version, also known as pre-print

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Citation for published version (APA):

Valmaggia, L. R., Day, F. L., Kroll, J., Laing, J., Byrne, M., Fusar-Poli, P., & McGuire, P. (2015). Bullying victimisation and paranoid ideation in people at ultra high risk for psychosis. *Schizophrenia Research*, 168(1-2), 68-73. <https://doi.org/10.1016/j.schres.2015.08.029>

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Bullying Victimisation and Paranoid Ideation in People at Ultra High Risk for Psychosis

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Total words abstract: 196

Total words (abstract and references excluded): 2,910

Abstract

Background: Bullying victimisation has been suggested to contribute to paranoid ideation in general population samples and recent evidence found that individuals with an Ultra High Risk for psychosis (UHR) are twice as likely to have been bullied than controls.

Aims: This study sought to examine whether a history of bullying would be associated with higher levels of paranoid ideation in individuals with an UHR and in healthy controls (HC).

Method: The study included 64 UHR and 43 HC participants. Following baseline assessment participants entered a Virtual Reality (VR) London Underground train. Paranoid ideation was measured immediately after the end of the VR experience.

Results: Compared to HCs, UHR participants described higher levels of childhood bullying (OR 5.19, 95% CI=2.21-12.19, $p<.001$) and experienced more paranoid ideation during VR ($\chi^2_{(1)}=21.06$, $p<.001$). Childhood bullying was associated with paranoid ideation during VR in both groups ($\chi^2_{(1)}=5.931$, $p=.021$) but prolonged exposure to bullying was not associated with increased paranoid ideation .

Conclusion: A history of bullying in childhood is particularly common in young adults at high risk for psychosis. However bullying is associated with paranoid ideation in later life, independent of clinical status, consistent with dimensional models of psychotic phenomena.

Keywords: bullying; paranoid ideation; at risk mental state; ultra high risk; psychosis.

Acknowledgements

Our special thanks go to the staff and service users of OASIS. We also acknowledge Prof Daniel Freeman, Dr Angus Antley and Prof Mel Slater for their advice and support with the Virtual Reality Lab. Dr Valmaggia was supported by a NARSAD Young Investigator Award from the Brain and Behaviour Research Foundation, by a Peggy Pollack Research Fellowship from the Psychiatry Research Trust. The authors acknowledge financial support from the National Institute for Health Research (NIHR) Biomedical Research Centre for Mental Health at South London and Maudsley NHS Foundation Trust and King's College London. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

Conflict of Interest

None.

Ethical Approval:

Research ethics approval was obtained from the National Research Ethics Service (Ethics REC number 08/H0722/45).

Funding:

NARSAD Young Investigator Award from the Brain and Behaviour Research Foundation, and Peggy Pollack Research Fellowship from the Psychiatry Research Trust. Both awarded to Dr Valmaggia.

1.1 Introduction

A number of recent studies and a meta-analysis indicate that there is an association between bullying and psychotic symptoms in general population samples (Campbell and Morrison, 2007, Kelleher et al., 2008, Schreier et al., 2009) and bullying in childhood has been found to be a strong risk factor in longitudinal studies for the development of psychotic disorders in adulthood (Arseneault et al., 2010). The nature of this relationship is less clear in cross-sectional studies of patients with an established psychotic disorder. One study has reported a correlation in patients with first episode psychosis (Trotta et al., 2013), but a meta-analysis of data from clinical samples was not conclusive (van Dam et al., 2012). Furthermore, previous studies have shown an association between paranoid ideation and early adverse experiences, including bullying, and suggested that developing psychotic symptoms after childhood bullying appears to be related to the frequency, severity and duration of the bullying (Pickering et al., 2008, Varese et al., 2012, Lopes, 2013, Kraan et al., 2015). The Ultra High Risk (UHR) state is associated with a clinical syndrome that is evident in young adults and typically involves psychotic symptoms and a recent decline in function (Fusar-Poli et al., 2013). Psychotic symptoms in people who meet the UHR criteria are qualitatively similar to those seen in psychotic disorders. Although the psychotic symptoms are less severe, they are usually distressing, leading the individual to seek clinical care. Individuals at UHR for psychosis are usually treatment-naïve, and thus provide an ideal group in which to examine this relationship. A recent study suggests that people at UHR for psychosis are twice as likely to have been bullied than controls (Addington et al., 2013), but the relationship between bullying and the severity of psychotic symptoms in this population has yet to be investigated. The severity of psychotic symptoms is usually assessed by asking the participant to provide a retrospective description of their beliefs and experiences. Psychotic symptoms can be evaluated in a more standardised way by using a Virtual Reality (VR) environment, which

provides an ecologically valid and controlled setting that can elicit paranoid experiences (Freeman et al., 2005, Valmaggia et al., 2007). VR environments such as a busy train carriage have been shown to induce paranoid ideation in healthy participants (Freeman et al., 2003, Green et al., 2011), people at UHR for psychosis (Valmaggia et al., 2007), and individuals with persecutory delusions (Fornells-Ambrojo et al., 2008, Veling et al., 2014). The environmental stimulus is identical in all participants, and their response can be evaluated as soon as they exit the environment, maximising the likelihood of obtaining an accurate assessment of their experiences.

In the present study, we used VR to assess paranoid ideation in young adults at UHR for psychosis. We then related their responses to their history of bullying in childhood, assessed using the Retrospective Bullying Questionnaire (RBQ). We tested the following hypotheses: First, that a history of bullying would be more common in UHR participants than in controls. Second, that a history of bullying would be associated with increased levels of paranoid ideation in the VR environment.

2.1 Method

2.1.1. Design

This study employed a cross-sectional, between participants independent design, which compared participants at UHR for psychosis to a matched healthy control group (HC).

2.1.2 Participants

Sixty-five UHR participants were recruited via Outreach and Support in South London (OASIS), a specialised service for young people at risk of psychosis (Fusar-Poli et al., 2012). All participants recruited to the study were over 18 years old and had never experienced a psychotic episode. The participants were managed clinically at OASIS. The catchment area

includes the boroughs served by South London and Maudsley NHS Foundation Trust. UHR individuals were assessed by the OASIS service using the Comprehensive Assessment of At-Risk Mental States (CAARMS) assessment tool (Yung et al., 2005) prior to participation in the research to establish that they met the one of more of the following PACE (Personal Assessment and Crisis Evaluation clinic) criteria for UHR: *Attenuated psychotic symptoms group*: patients have experienced subthreshold, attenuated positive psychotic symptoms during the past year; *Brief limited intermittent psychotic symptoms group*: patients have experienced episodes of frank psychotic symptoms that have not lasted longer than a week and have spontaneously remitted; or *Trait and state risk factor group*: patients have schizotypal personality disorder or have a first-degree relative with a psychotic disorder and have experienced a significant decrease in functioning during the previous year.

Conferral of an at-risk status was established by two experienced clinicians and a consensus meeting of the OASIS clinical team.

Local advertisements were used to recruit 45 HC participants who came from the same geographic region. All participants received a payment for their time and travel expenses and provided written informed consent prior to commencement of the study. The Prodromal Questionnaire (PQ) (Loewy et al., 2005) was use to screen HC for possible UHR symptoms. The PQ comprises four symptom subscales (positive symptoms, negative symptoms, disorganized symptoms, and general/affective symptoms). A positive symptom subscale score in excess of 18 indicates that further investigation of potential clinical symptomatology may be required (Loewy et al., 2005).

In the current study, one HC participant was excluded from subsequent analysis due to a score in excess of 18 on the PQ positive symptom subscale. The VR equipment failed while testing one HC participant and one UHR participant so their data were also excluded from the final analysis. This resulted in a total of 64 UHR and 43 HC participants.

2.1.3 Ethical approval

Research ethics approval was obtained from the National Research Ethics Service (Ethics REC number 08/H0722/45).

2.1.4 Materials

2.1.4.1 Socio-demographic information

Socio-demographic information was collected, which included age, gender, medical history, ethnicity, family history of psychiatric illness, years of education. Social class was estimated using information on parental occupation according to the National Readership Survey (<http://www.nrs.co.uk>) social grades classification to give two broad categories of “working class background” and “middle class background”.

2.1.4.2 Retrospective Bullying Questionnaire (RBQ)

The Retrospective Bullying Questionnaire (RBQ) examines self-reported experiences and appraisals of bullying. The questionnaire contains several sections with a total of 44 items (Schafer et al., 2004). Participants are asked to answer questions about their experiences during primary school and secondary school/college. The questions on bullying are divided into physical, verbal, and indirect forms. The questions focus on the frequency and intensity of the bullying experience (all 5 point scales), the duration of the bullying, the gender of the bully, and the number of aggressors involved. Frequency is assessed by asking the participant how often this happened (never to constantly); intensity is assessed by asking the participant how serious they considered the bullying attacks to be (not at all to extremely serious).

Participants were classified as victims according to their responses about the frequency and intensity of bullying (Hunter et al., 2004) using three criteria:

1. They indicated that they had been bullied in any way (physically, verbally, or indirectly) at any stage during school (primary, secondary, or both).
2. This happened 'sometimes' or more often.
3. They perceived the experience to be at least 'somewhat severe' and if they reported never having bullied others.

Prolonged bullying was defined as lasting 'weeks or months' or 'even longer' (Schafer et al., 2004).

2.1.4.3 State Social Paranoia Scale (SSPS)

The State Social Paranoia Scale (SSPS) (Freeman et al., 2007) is a 20-item self report questionnaire examining paranoia, specifically paranoid ideation about VR avatars. Each of the 20 items is rated on a five point scale from 1= 'do not agree' to 5= 'totally agree', with higher scores indicating higher endorsement. In addition to examining paranoid (10 items, range 10-50), neutral (5 items, range 5-25) and positive (5 items, range 5-25) ideation about the avatars is explored. A higher score reflects higher levels of ideation. The SSPS examines recent thinking within a controlled social situation rather than assessing stable, trait paranoia. Convergent validity was also shown with levels of paranoia in day-to-day life (Freeman et al., 2007). Based on the dataset, responses were grouped into four ordinal categories (corresponding to scores <10; 11–15; 16–25; >26).

2.1.5 Procedure

2.1.5.1 Virtual Reality Environment

The VR scenario was modelled on a London Underground tube train ride (developed by the Department of Computer Science at University College London), as used in previous studies (Fornells-Ambrojo et al., 2008, Freeman et al., 2008, Valmaggia et al., 2007). The environment was displayed in colour via a lightweight headset; the display used was a Virtual Research VR 1280 (Virtual Research Systems, Aptos, California), with a resolution of 1280x1024 pixels, 60° diagonal field of view and a refresh rate of 60 Hz. Participants would enter a train carriage and were asked to remain on board during the first stop. The carriage was populated with a variety of avatars representing passengers, some of whom would look towards the participant if the participant looks at them for a couple of seconds. None of the avatars spoke to the participant. After spending approximately four minutes on the train, participants disembarked at the second stop. Background noises were played using a Creative sound card, mimicking noises associated with a London Underground train ride (e.g., background rumble of the moving train, a “mind the doors” announcement when the doors were closing, fragments of passenger conversation). Participants were free to move around the virtual carriage, walking or turning as they wished. The total duration of the VR experience was approximately five minutes.

Prior to beginning the VR session, verbal instructions were provided by the researcher. Participants were asked to “*Try and form an impression of what the people in the tube think about you and what you think about them*”. Immediately after the tube ride experience participants were asked to complete the post-VR measures.

-- Figure 1 – VR Tube-

2.1.6 Statistical Analysis

Descriptive statistics including mean and standard deviation values for continuous variables and absolute and relative frequencies for categorical variables were calculated. Group differences in categorical variables were examined using the Chi-square test.

The level of statistical significance was set at $p < 0.05$ and all reported significance values were 2-tailed. Unadjusted odd ratios and confidence intervals were also calculated. Statistical analyses were performed using SPSS 19 (Statistical Package for the Social Sciences version 19, IBM etc.).

3.1 Results

3.1.1 Sample characteristics

There were no significant differences between groups in age, gender and ethnicity. The two groups differed in mean years of education and in employment status: compared to HC, UHR participants had significantly fewer years of education, and were more likely to be unemployed and to have come from a “working class” background.

-- Table 1 --

3.1.2 Bullying experiences

As illustrated in Table 2, the majority of UHR participants (66.7%) reported that they had been victims of bullying, as compared to 25.6% of HC participants (OR 5.19, 95% CI= 2.21-12.19, $p < .001$). Forty per cent of UHR participants and 14% of HC reported being the victim of bullying during primary school (typically when aged 5-12 years; OR=4.22, 95% CI 1.56-11.43, $p = .005$), while 53% of UHR and 19% of HC reported being a victim of bullying at secondary school (when aged 13-18 years; OR=4.96, 95% CI 1.99-12.34, $p < .001$).

Among those who had experienced bullying in either primary or secondary school, prolonged bullying was reported by 18 (42.9%) UHR vs. 3 (27.3%) HC participants (OR= 2.00, 95% CI 0.46-8.61, $p = .352$).

-- Table 2 --

3.1.3 Persecutory ideation

UHR participants were significantly more likely than controls to experience persecutory/paranoid ideation during the VR exposure. Half of the UHR group ($n=32$; 50%) but only 3 (7.1%) of the HC group scored 16 or more on the SSPS, indicating the presence of ‘at least some’ paranoid ideation ($\chi^2_{(1)} = 21.060$, $p < .001$).

When victims of bullying were compared to non-victims, independent of their clinical status, 23 (43.4%) of the bullied group and 11 (21.2%) of the non-bullied group scored 16 or more on the SSPS, indicating the presence of ‘at least some’ paranoid ideation ($\chi^2_{(1)} = 5.931$, $p = .021$).

- See Table 3 -

Participants were also dichotomized into those who were or were not victims of prolonged bullying, defined as lasting ‘weeks or more’. However there were no significant differences between these groups in paranoid ideation during VR ($\chi^2_{(1)} = .885$, $p = .494$).

4.1 Discussion

This study examined the relationship between a history of bullying and paranoid ideation in people at ultra high risk (UHR) for psychosis. As predicted, we found that a history of

bullying was associated with more paranoid ideation in later life, independent of the participants' clinical status. We also found that UHR participants reported significantly more bullying victimisation experiences than controls, and were much more likely to experience paranoid ideas in a VR environment.

How might being bullied increase the risk of paranoid ideation in later life?

It has been suggested that paranoia is associated with multiple aspects of self information-processing, in particular, self-esteem and attributional style (Cicero and Kerns, 2010), which may be created by a negative schematic model of the self and the world as a result of childhood trauma (Garety et al., 2001). While studies focusing on the cognitive aspects of paranoia are abundant, this perspective has been relatively neglected in the bullying literature. One study suggested that children who are victims of bullying demonstrate an implicit cognitive association of themselves as victims and greater use of emotionally dysregulated pre-emptive processing (Rosen et al., 2007). Specifically, this model proposed that victims create a 'victim schema' that is relied upon for social interactions. The employment of a 'victim schema' is hypothesised to result in an attributional bias whereby victims may inaccurately attribute hostile intent in social situations perceived as threatening. This is also supported by the cognitive models of psychosis and persecutory delusions (Garety et al., 2001, Garety et al., 2007, Freeman et al., 2002, Bentall et al., 2007, Morrison and Wells, 2003) which suggests that early adverse life experiences such as bullying, can lead to an enduring cognitive vulnerability, characterised by negative schematic models of the self and others which influence the appraisal of daily stressors (e.g. I am vulnerable, others are dangerous). It is plausible that bullying might trigger these negative schematic beliefs, be associated with emotional distress and contribute to higher rates of paranoid ideation (Lopes, 2013). Furthermore, recent work indicated that bullying victimisation is related not only to

negative schematic beliefs, but also to depression and social anxiety, in people at high risk of developing psychosis, (Addington et al., 2013). Although we found an association between victimisation and paranoia, the experience of victimisation could lead to depression and anxiety (Addington et al., 2013, Bond et al., 2001), which can influence the formation of paranoid ideation (Freeman et al., 2002, Garety and Freeman, 2013).

Increased prevalence of bullying in people at high risk for psychosis

Our findings are consistent with a previous report of an increased prevalence of bullying victimisation in UHR individuals (Addington *et al.*, 2013), and, more generally, with evidence of increased rates of adverse life events in this group (Addington et al., 2013, Bechdolf et al., 2010, Falukozi and Addington, 2012, Tikka et al., 2013, Thompson et al., 2014). These observations support the concept of a causal, dose-response relationship between victimisation and the risk and severity of psychotic symptoms (Bebbington et al., 2013, Lataster et al., 2013), although in the present study prolonged bullying was not associated with an increased level of paranoid ideation. Future work could investigate any cumulative effect of other forms of victimisation and adversity and the tendency for paranoid ideation in the VR environment, as well as the relation between adverse experiences and neurobiological abnormalities in the emergence of psychotic symptoms.

Previous studies have demonstrated that there may be an interaction between an individual's early characteristics and the risk of being bullied (Bowes et al., 2009, Bowes et al., 2013) and children with early developmental problems have been found to be at higher risk of social isolation (Matthews et al., 2015, Wertz et al., 2015). It is therefore plausible that individuals who have premorbid correlates of risk for psychosis may be more likely to become victims of bullying while growing up. Furthermore, characteristics associated with an increased risk of developing psychosis, may influence the self-report of bullying as well as the onset of

paranoid ideations. However, longitudinal studies have shown an independent effect of bullying during childhood, on the onset of later mental health problems (Lereya et al., 2015). Our results highlight the importance of early detection and that early preventive intervention should target both the psychotic symptoms and related social factors. Interestingly, Virtual Reality has recently been used to reduce bullying victimisation in primary school pupils (Sapouna et al., 2010) with promising results.

4.2 Limitations

Although the RBQ has good reliability and validity, the retrospective nature of these instruments makes it difficult to rule out the influence of recall biases on reports of victimisation. Second, due to the cross-sectional design, the possibility of recall bias could not be excluded: people who are prone to paranoid ideas might be more likely to report that they were previously bullied.

4.3 Conclusions

The relationship between bullying victimisation and paranoid ideation in young adults suggests a plausible mechanism to explain the link between early adverse experiences and the incidence of psychotic disorders that has recently been demonstrated in epidemiological studies (Arseneault et al., 2011, Takizawa et al., 2014, Kelleher et al., 2008, Kelleher et al., 2013). Bullying victimisation may have effects on cognitive processes that influence the development of psychotic symptoms.

5.1 References

- ADDINGTON, J., STOWKOWY, J., CADENHEAD, K. S., CORNBLATT, B. A., MCGLASHAN, T. H., PERKINS, D. O., SEIDMAN, L. J., TSUANG, M. T., WALKER, E. F., WOODS, S. W. & CANNON, T. D. 2013. Early traumatic experiences in those at clinical high risk for psychosis. *Early Interv Psychiatry*, 7, 300-5.
- ARSENEAULT, L., BOWES, L. & SHAKOOR, S. 2010. Bullying victimization in youths and mental health problems: 'much ado about nothing'? *Psychol Med*, 40, 717-29.
- ARSENEAULT, L., CANNON, M., FISHER, H. L., POLANCZYK, G., MOFFITT, T. E. & CASPI, A. 2011. Childhood trauma and children's emerging psychotic symptoms: A genetically sensitive longitudinal cohort study. *Am J Psychiatry*, 168, 65-72.
- BEBBINGTON, P. E., MCBRIDE, O., STEEL, C., KUIPERS, E., RADOVANOVIC, M., BRUGHA, T., JENKINS, R., MELTZER, H. I. & FREEMAN, D. 2013. The structure of paranoia in the general population. *Br J Psychiatry*, 202, 419-27.
- BECHDOLF, A., THOMPSON, A., NELSON, B., COTTON, S., SIMMONS, M. B., AMMINGER, G. P., LEICESTER, S., FRANCEY, S. M., MCNAB, C., KRSTEV, H., SIDIS, A., MCGORRY, P. D. & YUNG, A. R. 2010. Experience of trauma and conversion to psychosis in an ultra-high-risk (prodromal) group. *Acta Psychiatr Scand*, 121, 377-84.
- BENTALL, R. P., FERNYHOUGH, C., MORRISON, A. P., LEWIS, S. & CORCORAN, R. 2007. Prospects for a cognitive-developmental account of psychotic experiences. *Br J Clin Psychol*, 46, 155-73.
- BOND, L., CARLIN, J. B., THOMAS, L., RUBIN, K. & PATTON, G. 2001. Does bullying cause emotional problems? A prospective study of young teenagers. *BMJ*, 323, 480-4.
- BOWES, L., ARSENEAULT, L., MAUGHAN, B., TAYLOR, A., CASPI, A. & MOFFITT, T. E. 2009. School, neighborhood, and family factors are associated with children's bullying involvement: a nationally representative longitudinal study. *J Am Acad Child Adolesc Psychiatry*, 48, 545-53.
- BOWES, L., MAUGHAN, B., BALL, H., SHAKOOR, S., OUELLET-MORIN, I., CASPI, A., MOFFITT, T. E. & ARSENEAULT, L. 2013. Chronic bullying victimization across school transitions: the role of genetic and environmental influences. *Dev Psychopathol*, 25, 333-46.
- CAMPBELL, M. L. & MORRISON, A. P. 2007. The relationship between bullying, psychotic-like experiences and appraisals in 14-16-year olds. *Behav Res Ther*, 45, 1579-91.
- CICERO, D. C. & KERNS, J. G. 2010. Multidimensional factor structure of positive schizotypy. *J Pers Disord*, 24, 327-43.
- FALUKOZI, E. & ADDINGTON, J. 2012. Impact of Trauma on Attenuated Psychotic Symptoms. *Psychosis*, 4, 203-212.
- FORNELLS-AMBROJO, M., BARKER, C., SWAPP, D., SLATER, M., ANTLEY, A. & FREEMAN, D. 2008. Virtual reality and persecutory delusions: safety and feasibility. *Schizophr Res*, 104, 228-36.
- FREEMAN, D., GARETY, P. A., BEBBINGTON, P., SLATER, M., KUIPERS, E., FOWLER, D., GREEN, C., JORDAN, J., RAY, K. & DUNN, G. 2005. The psychology of persecutory ideation II: a virtual reality experimental study. *J Nerv Ment Dis*, 193, 309-15.
- FREEMAN, D., GARETY, P. A., KUIPERS, E., FOWLER, D. & BEBBINGTON, P. E. 2002. A cognitive model of persecutory delusions. *Br J Clin Psychol*, 41, 331-47.

- FREEMAN, D., PUGH, K., ANTLEY, A., SLATER, M., BEBBINGTON, P., GITTINS, M., DUNN, G., KUIPERS, E., FOWLER, D. & GARETY, P. 2008. Virtual reality study of paranoid thinking in the general population. *Br J Psychiatry*, 192, 258-63.
- FREEMAN, D., PUGH, K., GREEN, C., VALMAGGIA, L., DUNN, G. & GARETY, P. 2007. A measure of state persecutory ideation for experimental studies. *J Nerv Ment Dis*, 195, 781-4.
- FREEMAN, D., SLATER, M., BEBBINGTON, P. E., GARETY, P. A., KUIPERS, E., FOWLER, D., MET, A., READ, C. M., JORDAN, J. & VINAYAGAMOORTHY, V. 2003. Can virtual reality be used to investigate persecutory ideation? *J Nerv Ment Dis*, 191, 509-14.
- FUSAR-POLI, P., BORGWARDT, S., BECHDOLF, A., ADDINGTON, J., RIECHER-ROSSLER, A., SCHULTZE-LUTTER, F., KESHAVAN, M., WOOD, S., RUHRMANN, S., SEIDMAN, L. J., VALMAGGIA, L., CANNON, T., VELTHORST, E., DE HAAN, L., CORNBLATT, B., BONOLDI, I., BIRCHWOOD, M., MCGLASHAN, T., CARPENTER, W., MCGORRY, P., KLOSTERKOTTER, J., MCGUIRE, P. & YUNG, A. 2013. The psychosis high-risk state: a comprehensive state-of-the-art review. *JAMA Psychiatry*, 70, 107-20.
- FUSAR-POLI, P., BYRNE, M., BADGER, S., VALMAGGIA, L. R. & MCGUIRE, P. K. 2012. Outreach and support in South London (OASIS), 2001-2011: Ten years of early diagnosis and treatment for young individuals at high clinical risk for psychosis. *Eur Psychiatry*.
- GARETY, P. A., BEBBINGTON, P., FOWLER, D., FREEMAN, D. & KUIPERS, E. 2007. Implications for neurobiological research of cognitive models of psychosis: a theoretical paper. *Psychol Med*, 37, 1377-91.
- GARETY, P. A. & FREEMAN, D. 2013. The past and future of delusions research: from the inexplicable to the treatable. *Br J Psychiatry*, 203, 327-33.
- GARETY, P. A., KUIPERS, E., FOWLER, D., FREEMAN, D. & BEBBINGTON, P. E. 2001. A cognitive model of the positive symptoms of psychosis. *Psychol Med*, 31, 189-95.
- GREEN, C. E., FREEMAN, D., KUIPERS, E., BEBBINGTON, P., FOWLER, D., DUNN, G. & GARETY, P. A. 2011. Paranoid explanations of experience: a novel experimental study. *Behav Cogn Psychother*, 39, 21-34.
- HUNTER, S. C., MORA-MERCHAN, J. M. & ORTEGA, R. E. 2004. The long-term effects of coping strategy use in victims of bullying. *The Spanish Journal of Psychology*, 7, 3-12.
- KELLEHER, I., HARLEY, M., LYNCH, F., ARSENEAULT, L., FITZPATRICK, C. & CANNON, M. 2008. Associations between childhood trauma, bullying and psychotic symptoms among a school-based adolescent sample. *Br J Psychiatry*, 193, 378-82.
- KELLEHER, I., KEELEY, H., CORCORAN, P., RAMSAY, H., WASSERMAN, C., CARLI, V., SARCHIAPONE, M., HOVEN, C., WASSERMAN, D. & CANNON, M. 2013. Childhood trauma and psychosis in a prospective cohort study: Cause, effect, and directionality. *American Journal of Psychiatry*, 170, 734-741.
- KRAAN, T., VELTHORST, E., SMIT, F., DE HAAN, L. & VAN DER GAAG, M. 2015. Trauma and recent life events in individuals at ultra high risk for psychosis: Review and meta-analysis. *Schizophr Res*, 161, 143-149.
- LATASTER, T., VALMAGGIA, L., LARDINOIS, M., VAN OS, J. & MYIN-GERMEYS, I. 2013. Increased stress reactivity: a mechanism specifically associated with the positive symptoms of psychotic disorder. *Psychol Med*, 43, 1389-400.

- LEREYA, S. T., COPELAND, W. E., COSTELLO, E. J. & WOLKE, D. 2015. Adult mental health consequences of peer bullying and maltreatment in childhood: two cohorts in two countries. *The Lancet Psychiatry*.
- LOEWY, R. L., BEARDEN, C. E., JOHNSON, J. K., RAINE, A. & CANNON, T. D. 2005. The prodromal questionnaire (PQ): preliminary validation of a self-report screening measure for prodromal and psychotic syndromes. *Schizophr Res*, 79, 117-25.
- LOPES, B. C. 2013. Differences between victims of bullying and nonvictims on levels of paranoid ideation and persecutory symptoms, the presence of aggressive traits, the display of social anxiety and the recall of childhood abuse experiences in a Portuguese mixed clinical sample. *Clin Psychol Psychother*, 20, 254-66.
- MATTHEWS, T., DANESE, A., WERTZ, J., AMBLER, A., KELLY, M., DIVER, A., CASPI, A., MOFFITT, T. E. & ARSENEAULT, L. 2015. Social Isolation and Mental Health at Primary and Secondary School Entry: A Longitudinal Cohort Study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 54, 225-232.
- MORRISON, A. P. & WELLS, A. 2003. A comparison of metacognitions in patients with hallucinations, delusions, panic disorder, and non-patient controls. *Behav Res Ther*, 41, 251-6.
- PICKERING, L., SIMPSON, J. & BENTALL, R. P. 2008. Insecure attachment predicts proneness to paranoia but not hallucinations. *Personality and Individual Differences*, 44, 1212-1224.
- ROSEN, P. J., MILICH, R. & HARRIS, M. J. 2007. Victims of Their Own Cognitions: Implicit Social Cognitions, Emotional Distress, and Peer Victimization. *Journal of Applied Developmental Psychology*, 28, 211-226.
- SAPOUNA, M., WOLKE, D., VANNINI, N., WATSON, S., WOODS, S., SCHNEIDER, W., ENZ, S., HALL, L., PAIVA, A., ANDRE, E., DAUTENHAHN, K. & AYLETT, R. 2010. Virtual learning intervention to reduce bullying victimization in primary school: a controlled trial. *J Child Psychol Psychiatry*, 51, 104-12.
- SCHAFER, M., KORN, S., SMITH, P., HUNTER, S., MORA-MERCHAN, J., SINGER, M. & VAN DER MEULEN, K. 2004. Lonely in the crowd: Recollections of bullying. . *British Journal of Developmental Psychology*, 22, 379-394.
- SCHREIER, A., WOLKE, D., THOMAS, K., HORWOOD, J., HOLLIS, C., GUNNELL, D., LEWIS, G., THOMPSON, A., ZAMMIT, S., DUFFY, L., SALVI, G. & HARRISON, G. 2009. Prospective study of peer victimization in childhood and psychotic symptoms in a nonclinical population at age 12 years. *Arch Gen Psychiatry*, 66, 527-36.
- TAKIZAWA, R., MAUGHAN, B. & ARSENEAULT, L. 2014. Adult health outcomes of childhood bullying victimization: Evidence from a five-decade longitudinal British birth cohort. *American Journal of Psychiatry*, 171, 777-784.
- THOMPSON, A. D., NELSON, B., YUEN, H. P., LIN, A., AMMINGER, G. P., MCGORRY, P. D., WOOD, S. J. & YUNG, A. R. 2014. Sexual trauma increases the risk of developing psychosis in an ultra high-risk "prodromal" population. *Schizophr Bull*, 40, 697-706.
- TIKKA, M., LUUTONEN, S., ILONEN, T., TUOMINEN, L., KOTIMAKI, M., HANKALA, J. & SALOKANGAS, R. K. 2013. Childhood trauma and premorbid adjustment among individuals at clinical high risk for psychosis and normal control subjects. *Early Interv Psychiatry*, 7, 51-7.
- TROTТА, A., DI FORTI, M., MONDELLI, V., DAZZAN, P., PARIANTE, C., DAVID, A., MULE, A., FERRARO, L., FORMICA, I., MURRAY, R. M. & FISHER, H. L. 2013. Prevalence of bullying victimisation amongst first-episode psychosis patients and unaffected controls. *Schizophr Res*, 150, 169-75.

- VALMAGGIA, L. R., FREEMAN, D., GREEN, C., GARETY, P., SWAPP, D., ANTLEY, A., PRESCOTT, C., FOWLER, D., KUIPERS, E., BEBBINGTON, P., SLATER, M., BROOME, M. & MCGUIRE, P. K. 2007. Virtual reality and paranoid ideations in people with an 'at-risk mental state' for psychosis. *Br J Psychiatry Suppl*, 51, s63-8.
- VAN DAM, D. S., VAN DER VEN, E., VELTHORST, E., SELTEN, J. P., MORGAN, C. & DE HAAN, L. 2012. Childhood bullying and the association with psychosis in non-clinical and clinical samples: a review and meta-analysis. *Psychol Med*, 42, 2463-74.
- VARESE, F., SMEETS, F., DRUKKER, M., LIEVERSE, R., LATASTER, T., VIECHTBAUER, W., READ, J., VAN OS, J. & BENTALL, R. P. 2012. Childhood adversities increase the risk of psychosis: a meta-analysis of patient-control, prospective- and cross-sectional cohort studies. *Schizophr Bull*, 38, 661-71.
- VELING, W., BRINKMAN, W. P., DORRESTIJN, E. & VAN DER GAAG, M. 2014. Virtual reality experiments linking social environment and psychosis: a pilot study. *Cyberpsychol Behav Soc Netw*, 17, 191-5.
- WERTZ, J., ZAVOS, H., MATTHEWS, T., HARVEY, K., HUNT, A., PARIANTE, C. M. & ARSENEAULT, L. 2015. Why some children with externalising problems develop internalising symptoms: testing two pathways in a genetically sensitive cohort study. *J Child Psychol Psychiatry*, 56, 738-46.
- YUNG, A. R., YUEN, H. P., MCGORRY, P. D., PHILLIPS, L. J., KELLY, D., DELL'OLIO, M., FRANCEY, S. M., COSGRAVE, E. M., KILLACKEY, E., STANFORD, C., GODFREY, K. & BUCKBY, J. 2005. Mapping the onset of psychosis: the Comprehensive Assessment of At-Risk Mental States. *Aust N Z J Psychiatry*, 39, 964-71.

Tables

Table 1 *Demographic Characteristics of the Sample*

| | UHR N=64 | HC N=43 | Test |
|--|---------------------|--------------------|------------------------------------|
| Age (years) Mean | | | |
| | 22.55 (SD 4.01) | 24.02 (SD 4.01) | t = -1.857 (df 105) p=.066 |
| Gender N (%) N (%) | | | |
| Male | 38 (59.4) | 20 (46.5) | χ^2 =.1.714 (df 1) p=.190 |
| Female | 26 (40.6) | 23 (53.5) | |
| Ethnicity | | | |
| Black | 19 (29.7) | 10 (23.3) | χ^2 = .899 (df 3) p = .826 |
| White British | 23 (35.9) | 16 (37.2) | |
| White Other | 11 (17.2) | 7 (16.3) | |
| Other | 11 (17.2) | 10 (23.3) | |
| Employment Status | | | |
| Employed | 16 (25) | 20 (46.5) | χ^2 =27.297 (df 2) p<.001 |
| Student | 12 (18.8) | 20 (46.5) | |
| Unemployed | 36 (56.3) | 3 (7) | |
| Level of Education | | | |
| Higher education or degree | 8 (12.7) | 14 (32.6) | χ^2 =12.314 (df 3) p=.006 |
| A-level or further education | 33 (52.9) | 25 (58.1) | |
| GCSE level or vocational | 18 (28.6) | 4 (9.3)[Fisher] | |
| No qualification | 4 (6.3) [Fisher] | 0 [Fisher] | |
| NRS Social grade | | | |
| Higher | 19 (33.3) | 25 (61) | χ^2 =11.895 (df 2) p=.003 |
| Middle | 18 (31.6) | 13 (31.7) | |
| Lower | 20 (35.1) | 3 (7.3)[Fisher] | |

UHR: Ultra High Risk; HC: healthy controls; Sd: standard deviation.

Table 2 Experiences of Bullying Victimization

| | UHR N=64 N (%) | HC N=43 N (%) | Chi Square | OR | 95% CI | p |
|--|---|--|---|-----------|-----------------|----------|
| Victim Ever | 42 (66.7) | 11 (25.6) | $\chi^2 =$ 17.256 (df 1) p <.001 | 5.19 | 2.21 - 12.19 | <.001 |
| Victim in Primary School | 26 (41.3) | 6 (14) | $\chi^2 =$ 9.049 (df 1) p=.003 | 4.22 | 1.56- 11.43 | .005 |
| Victim in Secondary School | 34 (54) | 8 (18.6) | $\chi^2 =$ 13.360 (df 1) p< .001 | 4.96 | 1.99 – 12.34 | <.001 |
| Of those bullied (ARMS N=42 and HC N=11) Prolonged Victim | 18 (42.9) | 3 (27.3) | $\chi^2 =$.885 (df 1) p=.494 | 2.00 | 0.46-8.61 | .352 |

UHR: Ultra High Risk; HC: Healthy Controls; OR: Odd Ratio; CI: Confidence Interval

Table 3.VR Persecution as Measured by the SSPS

| SSPS Persecution | ARMS N (%) | HC N (%) | Chi Square | Victim of bullying | Non- Victim of bullying | Chi Square |
|-----------------------------|-----------------------|---------------------|---|-------------------------------|--|---------------------------------------|
| 0-10 | 16 (25) | 21 (50%) | $\chi^2 =$.21.060 (df 1) p<.001 | 14 (26.4) | 23 (44.2) | $\chi^2 = 5.931$ (df 1) p= .021 |
| 11-15 | 16 (25) | 18 (42.9) | | 16 (30.2) | 18 (34.6) | |
| 16-20 | 5 (7.8) | 2 (4.8) | | 3 (5.7) | 4 (7.7) | |
| 21-25 | 8 (12.5) | 0 | | 6 (11.3) | 1 (1.9) | |
| 26-30 | 7 (10.9) | 1 (2.4) | | 5 (9.4) | 3 (5.8) | |
| >30 | 12 (18.8) | 0 | | 9 (17) | 3 (5.8) | |

Please note the statistical comparison is between those who scored 0 to 15 versus those who scored 16 or higher.



Figure 1. Virtual Reality London Underground train carriage